LARVAE OF HOMODES MIMICKING THE AGGRESSIVE OECOPHYLLA ANT IN SOUTHEAST ASIA (LEPIDOPTERA, NOCTUIDAE)

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(With a coloured plate)

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Introduction. While collecting data from the files of the Institute for Plantdiseases at Bogor for my book on the pests of Indonesian crops, I found a note on a small Noctuid larva adorned with long filaments, which was considered to mimic the well-known aggressive *Oecophylla* ants. The note was written by Awibowo, sometime entomological assistant, who worked with the late Dr. S. Leefmans. There were coloured drawings and corresponding pen-drawings by a native artist in the same portfolio.

The case described appeared too interesting to be left unpublished. However, I preferred to give more complete notes and references, and their collecting was only recently completed.

The original note by Awibowo may be translated as follows.

"It was during my field-work, which included investigations on ants, that I observed this peculiar insect. Dr. Leefmans had already informed me about its occurrence and how he had failed to breed the moth out of the single specimen he had found because it was parasitized. Dr. Leefmans had also lent me Shelford's book "A Naturalist in Borneo", in which a similar larva is mentioned and figured. All the larvae I had collected could be reared to moths. Specimens submitted to the British Museum of Natural History in London were identified as *Homodes fulva* (Hamps.).

"The larva in question mimics the ngrangrang ant, *Oecophylla smaragdina*, in a very striking manner. This is not shown by the drawing I had made. It is the appearance as a whole of the moving larva that causes the deception. On the host-plant the greenish body of the larva is camouflaged and only the brown-coloured parts are conspicuous. One's attention is first drawn to the insect by the appendages occurring on every segment of the body and which are kept in constant movement."

[Here follows a passage which is in conformity with Shelford's description of the behaviour of a disturbed larva imitating the ant (see below).]

"Furthermore it is noteworthy that these larvae were found on a mango tree which was visited by a multitude of ngrangrang ants. On some 200 other mango trees which were visited by species of ants other than *Oecophylla* — for instance the reddish gramang ants, *Anaplolepis longipes* — the larvae could not be found, though I was on the look-out for them.

No connections between the ants and the larvae could be observed. The ants which were present in abundance did not take any notice whatsoever of the larvae, and the latter could be reared in the laboratory with no ants present. They fed on the tender, newly unfolded mango leaves. After a week they started preparing for pupation by making cuts in the leaves and rolling the flaps into a small case. The pupal period was 9 days."

Notes from the literature. SHELFORD published his observations on the curious larva first in his extensive paper on mimetic insects and spiders of 1902. These notes are somewhat more comprehensive than those in his book and therefore the main passages, to be quoted here, have been taken from this paper and only a few additional lines from the book itself.

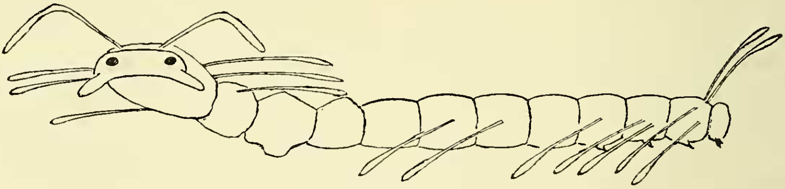

Fig. 1. Sketch of a Noctuid larva mimicking *Oecophylla ants* in Malaya. (After SHELFORD, 1916, plate XVI)

"In Jan. 1900 a curious Noctuid larva...... was pointed out te me by Mr. H. N. Ridley in the Botanic Gardens, Singapore, resting on a leaf of a tree much frequented by the common red ant *Oecophylla smaragdina*......

When the larva is irritated, the posterior part of the body is immediately reared in the air, the anal prolegs are thrown widely apart and the tentacles, especially the most posterior pair, are violently agitated. When the caterpillar is seen in an end-on position or when the anterior two-thirds of the body are hidden, the resemblance to the ant is positively startling: the black eye-spots represent the eyes, the widely-diverging anal prolegs, the gaping jaws and the tentacles, the antennae and legs of the model; the posterior pair of tentacles are so curved that they represent very accurately the elbowed antennae of the ant." (1902).

"It is very difficult to convey by a description, or even by a drawing, the very startling resemblance of this caterpillar to an ant, yet the resemblance will not really bear a close examination, for the caterpillar is much longer than the ant, and moreover the anterior part of the body plays no part in the likeness. It is more of the nature of an impressionist sketch, and like many impressionist sketches is startling in its likeness to the model, though not bearing close scrutiny." (1916).

To his note in his book SHELFORD adds a sketchy drawing of the larva, which is reproduced here (fig. 1).

Important additional details on the insect in question, observed in Malaya, are to be found in a paper on "Miscellaneous insects of 1925" by CORBETT & GATER, who give the identification as *Homodes bracteigutta* (Walk.). The passage referred to may be cited in full.

"A Noctuid caterpillar, with spatulate hairs, resembling two "karingas" or red ants (*Oecophylla smaragdina*) jointed together, has been recorded, on a number of occasions slightly injuring the tapping surface of rubber. This caterpillar has been known for some time, but only comparatively recently was success obtained in breeding it out. It would appear to be confined to certain localities and most enquiries have been received from the district of Malacca."

In MILLER's "Preliminary list of foodplants of some Malayan insects" based on records which became available 1927—1932, "Cinnamom, Rubber" are mentioned for *Homodes bracteigutta* Walk. and "Rubber" for *H. perilitha* Hamps. and *Homodes* n.sp.*).

Observations in Java. Four moths in the series of *Homodes* specimens in the Leiden Museum have a number on their labels which refers to the original notes of the collector M. C. PIEPERS in his diary "Entomologische Aanteekeningen", being a number of exercise books which are in the possession of the library of the Nederlandsche Entomologische Vereeniging at Amsterdam. They contain the following information (translated):

Moths identified in the Leiden Museum as *Homodes crocea* Gn.: Batavia 1891, nr. 4515 and 4525. "Very strange caterpillar on djamblang [probably *Eugenia cumini* Merr. Khv.]. A pseudo-looper with the first pair of prolegs in a rudimentary state. Entirely hairless, thin and long, glossy, slate-coloured. On the sides of the thoracic segments, on some of the central segments, and on the posterior segments long appendages project which are movable voluntarily. They consist of very thin, thread-like stalks, being thickened ear-like over the apical half. Head lighter, grey-coloured, not glossy, with a faint vertical dark stripe on each side."

Moths identified as *Homodes vivida* Gn. in the Leiden Museum: Buitenzorg, 1892, nr. 5754. "On coffee plant. Hairless, brown pseudo-looper, resembling a centipede, first pair of prolegs failing, second pair imperfect. On both sides of every segment a thread-like appendage stands out, with a knob at the end. Similar appendages on the first thoracic segment project in front of the head, and some backwards from the posterior part. All these appendages are capable of voluntary ("willekeurig") movement." Bogor, 1893, nr. 6470: "On arendung [probably a Melastomataceous shrub, *Melastoma malabathricum* L. or *Clidemia hirta* Don. Khv.]. Pseudolooper with three pairs of prolegs, the first pair failing. Dirty green, carrying dark hairs, differing in length and size, which at the top have a dark-brown, round, rather large knob, and are continually waving when the larva moves along. They resemble the antennae of certain ants."

A moth, later identified as *Homodes fulva* (Hamps.) in London, was bred from a few larvae found by my assistant, the forest ranger WARNODIHARDJO, on the inflorescences of a "tutup" tree (Euphorbiaceae, *Macaranga* or *Mallotus* sp.) in the teak woods near the field station for forest entomology at Gedangan, Central Java, 9.VII.1931. The cage-slip carries a note witten by me (translated): "Small, slender larva, of a very peculiar facies because of the long clavate appendages along the body, directed forwards at the anterior part and backwards at the posterior end. They are planted on high warts and are kept waving up and down when the larva is moving. Colour of the larva light-brown with yellow side-stripe. The larva has some similarity to a centipede. It has been observed also on the inflorescences of the teak tree by Warno." The centipede I had in view was a curious long-legged species, probably *Ortothereua longicornis*, belonging to the Scutigeromorpha, as Mr. C. A. W. JEEKEL, the Myriapod specialist of the Amsterdam Museum, has informed me.

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*) There are some errors in the spelling of the species' names originally given by CORBETT & GATER and by MILLER, which are corrected here.

Another specimen of *Homodes fulva* was bred from one of three larvae collected by the same assistant from the leaves of "sono sissoo" (*Dalbergia sissoo*) near the field station. The larva was brought to the laboratory on 26 February, it pupated on 3 March, and the moth appeared on 12 March, 1934.

The morphological features of the larva. The colour plate shows the curious features of the mimetic larva, observed in Bogor, the attitude being that of a specimen at rest. The arrangement of the ribbon-like filaments, which are of very different length, is the same as that mentioned by SHELFORD in his 1902 paper for the "tentacles" of his Singapore specimen. However, the drawing shows one lateral and one dorsal pair of filaments on segment 3 and one pair of lateral filaments on segment 4 while SHELFORD mentions two pairs of laterals for segment 3 and "unprovided with tentacles" for segment 4. The rather conspicuous prominence on segment 8 is also mentioned by SHELFORD. He did not give any details on the colour of the larvae. Our plate shows an olive-greenish tint of the body — agreeing with AWIBOWO's and one of PIEPERS' annotations — and longitudinal undulating lines, the borders of the segments being marked as brownish rings, the filaments being light brown. The thickened pair of appendages on the last segment are more club-like and less "elbowed" than one might expect from SHELFORD's description. The similar pair on the first thoracic segment and projecting in front of the head is not mentioned by SHELFORD. It is difficult to imagine how the thick appendages on the posterior end resemble the antennae of an ant as SHELFORD has specified. As this author and AWIBOWO have pointed out, however, a strict resemblance is not necessary, the general impression being of first importance. The dorsal filaments on the thoracic segment appear to be stalked on high warts, another feature not mentioned by SHELFORD but confirming one of the details I gave about the larvae observed in the teak forests.

Remarks on the taxonomy of the Homodes species. The moths of the genus appear to be generally brightly coloured with reddish, orange, and purplish tints, some of them showing silvery spots on the wings. Here may follow a few details on the five species which have been mentioned in the previous paragraphs.

H. crocea Gn. 1852, was described from a single male, wing-span 30 mm. The type specimen is preserved in the British Museum, London and is collected by HORSFIELD, who lived in Central Java. The species has been recorded since also from Ceylon, the Andaman Islands, Singapore, East Java, and Northern Celebes. In the Leiden Museum seven specimens are placed under the label *H. crocea*, six from Batavia, West Java, 1883—1891, apparently captured or bred by PIEPERS, and one from Malang, in the hills of Eastern Java. Wing-span 28—33 mm.

H. vivida Gn. 1852, described from specimens taken in Bombay, wing-span 28 mm, was typified by its author as extremely near to *H. crocea*, and perhaps only a variety of it. Since 1852 the species has also been recorded from Ceylon, Borneo, Java, Celebes, Ambon and New Guinea, and the subspecies *lassula* Prout from Sumatra. The four specimens under the label *H.vivida* in the Leiden Musuem are from Buitenzorg, West Java, 250 m, 1892—1893, wing-span 23—26 mm. They have been bred or collected by PIEPERS.

H. fulva Hampson, 1896, was described from specimens originating from Ceylon and Borneo, wing-span 24—30 mm. The species has also been recorded from Tonkin (DE JOANNIS, 1929). None of the specimens bred in West Java and Central Java are present in the Netherlands collections.

H. bracteigutta (Walker, 1862) was described from a specimen collected in Sarawak, Borneo. As stated in a previous paragraph the species has also been mentioned as occurring in Malaya (CORBETT & GATER, MILLER).

H. perilitha Hampson, 1926, was described from Pulo Laut Island, off the south-east point of Borneo. As stated before this species was mentioned by MILLER for Malaya.

Five other *Homodes* species have been described, all originating from the Indomalayan, Papuan and Australian regions, viz.:

H. iomolybda Meyrick, 1889, Dinner Island.

H. irretita Swinhoe, 1905, Assam, Khasis, 32 mm. Later also recorded from Singapore.

H. punctistriga Beth. Bak., 1906, East New Guinea.

H. lithographa Hampson, 1926, from the Solomon Islands and the d'Entrecasteaux Islands.

H. ornata Roepke, 1938, Northern Celebes, 29 mm.

Judging from the colour slides, made of specimens belonging to 8 species and most kindly presented to me by Dr. W. H. T. TAMS, all these species are nearly related and one may expect that a taxonomic revision of all the material available will reveal some synonyms or varieties.

It must be added that six specimens are in the Leiden Museum under the label *Homodes regularis* Snellen. This name was provisionally given by SNELLEN in 1880 to three specimens from Celebes. The moths in this series have the same general pattern as those of *crocea* and *vivida* but they have a brownish colour instead of the red-and-orange colours of the last named species. Two specimens are from Java — one of 25 mm wing-span from Sindanglaja (at the foot of Mount Gedé, 1200 m), 1881, and one of 19 mm from Pekalongan (at the North coast of Central Java) —, and four specimens are from Makassar, Celebes, measuring 26—30 mm.

Finally it is of interest that a moth from Africa, again showing the same general colour pattern, has been described as *Homodina argentifera* Hampson, 1926. The ant genus *Oecophylla* does also occur in Africa.

The feeding habits of Homodes larvae. From the particulars given in the preceding paragraphs it is evident that the *Homodes* larvae are rather unselective with regard to the botanical affinities of their food-plants. Eight host-plants have been listed, viz., *Hevea* for Malaya, and *Mangifera, Eugenia, Coffea, Dalbergia, Tectona,* an Euphorbiaceous, and a Melastomataceous plant for Java, the latter seven all belonging to different families. However, the larvae appear to be specialized in feeding on the young tender parts of plants, including newly unfolded leaves, inflorescences and even the soft tissue of fresh tapping wounds on *Hevea* trunks. From one of the drawings on the plate it can be seen that when feeding on young leaves the larvae eat small patches of the disk, causing perforations.

Discussion of the Homodes mimicry. It is accepted here that the conclusions of SHELFORD and of AWIBOWO, which viewpoints were apparently shared by RIDLEY and LEEFMANS, are right, and that the disturbed larvae of *Homodes* mimic the *Oecophylla* ants in their prancing attitude. It also appears to be acceptable that there is some resemblance to two *Oecophylla* ants joined together, as was the impression of CORBETT & GATER. On the whole the larvae may present the same picture in movement and colours as *Oecophylla* ants do when they are busily moving on the leaves and branches always ready to attack any intruders. The alleged resemblance of the larvae to a long-legged centipede, which apparently suggested itself to other observers who had not seen the larvae in their natural surroundings, may be discarded.

The following passage in SHELFORD's paper of 1902 is of much interest: "The *Oecophylla*, one would imagine, has firmly established a reputation for ferocity, and consequently the mimicking larva can the more easily deceive its enemies, in spite of its too elongate body. Only two specimens were found, both were walking on leaves and were readily distinguishable; but the violently threatening attitude each assumed when irritated was unmistakable, and the resemblance of the elevated posterior end to the ant so striking, that it is difficult to imagine how a lizard or frog with a previous experience of the ant could fail to be deterred."

The meaning of the mimetic resemblance must be mainly sought, I think, in the protection it gives against such insect-hunting animals as monkeys, shrews and birds, which certainly shun the *Oecophylla* ants. These ants are particularly apt at taking hold of hairs or feathers of animals (and men!) that come too near to their mandibles, tenaciously cling to them and pull them. This gives the victims the painful sensation of being stung.

The *Homodes* larvae may therefore be placed in the category of insects with pseudaposematic appearance (CARPENTER).

The myrmecophilous character of Homodes. There is still a remarkable feature in the ecology of the *Homodes* larvae which has to be discussed, viz., the fact that they are not attacked by the ants, which as a rule fall upon any strange animal they come across on their trails. Though it is accepted that a mimetic appearance tends to deceive non-insect predators, one still may wonder whether the "dressing up" of the larvae and their "gesticulations" may be the cause of their not being recognized as prey and of their being tolerated as equals. So the larvae are enabled to feed on the tender parts of various plants, which are a choice food for many insects. The same parts are frequented by the *Oecophylla* ants for visiting the honey-dew producing insects — particularly Membracids, Coccids and similar species — as well as any nectaria (KALSHOVEN 1951). From the observations of AWIBOWO it can be deduced that the *Homodes* moths select plants inhabited by the *Oecophylla* ants for oviposition.

In this respect the *Homodes* species may therefore be classified among the myrmecophilous insects.

Comparison with Tinoleus larvae. Finally attention may be drawn here to the fact that there is another Noctuid semi-looper living in S.E. Asia that has ribbon-like and constantly moving appendages on its body segments, viz. *Tinoleus eburneigutta* Walk. SHELFORD apparently also noticed the analogy for he tentatively classified his Noctuid as "(?Genus *Tinoleus*)". Now the *Tinoleus* larvae are much larger than the *Homodes* larvae and they have dark and black colours (Plate 7). They feed in numbers on the leaves and flowers of *Thunbergia grandiflora,* an imported ornamental climber which has run wild in the gardens of Bogor. The original foodplants may be sought among the indigenous Acanthaceae. The peculiar appearance of the *Tinoleus* larvae has also puzzled naturalists but the only explanation which has been given, as far as I know, is that the filaments are a kind of sensory organs (KONINGSBERGER 1915 p. 150, DUPONT 1936 p. 182). I also found a note that these larvae are not hindered by the ants which visit plants in large numbers for the sake of the nectaria (BACKER 1916 p. 118). The ants which are said not to be aggressive at all, are, if I remember rightly, the very common, black *Dolichoderus bituberculatus* Mayr. Still it may be assumed that the *Tinoleus* larvae are left undisturbed by enemies like small mammals and birds, which are shy of plants frequented by multitudes of ants and are deceived by the unusual appearance of the larvae.

ACKNOWLEDGEMENTS

It is mainly the great interest my friend Dr. A. DIAKONOFF of the Leiden Museum showed in the original notes and drawings at my disposal and relating to the *Homodes* larvae that stimulated the completion of the collecting of all data available on these curious species. I am much indebted to Professor W. ROEPKE, Wageningen, for lending me all the notes in his files referring to the *Homodes* species and to Mr. W. H. T. TAMS in London, who gave me most valuable additional information and provided me with a series of photographs and colour slides of types and specimens of *Homodes* sp. kept in the British Museum.

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SUMMARY

A curious Noctuid larva from Singapore, having movable appendages and apparently mimicking the agressive *Oecophylla* ants, as described by SHELFORD in 1902, has been found to be nearly related to similarly adorned and behaving larvae observed in Java. The latter yielded moths belonging to the genus *Homodes.* A compilation is given of notes on *Homodes* spp. from published and unpublished sources, including data on the host-plants, and a water colour drawing, made in Bogor, is reproduced. The significance of the striking mimetic features is discussed and the insects are classified as myrmecophilous. Attention is drawn to a *Tinoleus* larva which possesses similar appendages, their significance being sought also in deceiving predatory animals.

REFERENCES

BACKER, C. A., 1916, „Thunbergia grandiflora". De Tropische Natuur, 5.

CARPENTER, G. D. H. and E. B. FORD, 1933. „Mimicry". London.

CORBETT, G. H. and B. A. R. GATER, 1926. "Miscellaneous insects of 1925". Mal. Agric. Jrn., 14, p. 242.

DUPONT, F. and G. J. SCHEEPMAKER, 1936. „Uit Java's Vlinderleven". Batavia.

KALSHOVEN, L. G. E., 1951. „De Plagen van de Cultuurgewassen in Indonesië, vol. II".

KONINGSBERGER, J. C., 1915. „Java Zoölogisch en Biologisch". Buitenzorg.

MILLER, N. C. E., 1932. "Preliminary list of foodplants of some Malayan insects". Dep. Agric. S.S. and F.M.S., Supplement to Bulletin 38.

SHELFORD, R., 1902. "Observations on some mimetic insects and spiders from Borneo and Singapore". Proc. Zool. Soc. London, vol. 2, p. 230 (254).

SHELFORD, R., 1916. "A naturalist in Borneo".

SNELLEN, P. C. T., 1880. "Lepidoptera of Celebes, Heterocera II". Tijds. v. Ent., vol 23, p. 66.